

Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Douger Branch (Chat Creek)

Waterbody Segment at a Glance:

County: Lawrence
Nearby Cities: Aurora
Length of impairment: 2.0 miles
Pollutant: Zinc
Source: Underground Lead-Zinc mines



State map showing location of watershed

TMDL Priority Ranking: Low

Description of the Problem

Beneficial uses of Chat Creek (Douger Branch)

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

- Missouri's Water Quality Standards for zinc can be found in 10 CSR 20-7.031 Table A. The applicable standard is dependent on the hardness of the water and follows the formula:

Acute: $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.884211)} * 0.978 = \mu\text{g/L}^1$ of Dissolved Zinc

Chronic: $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.785271)} * 0.986 = \mu\text{g/L}$ of Dissolved Zinc

Using a hardness of 141 mg/L, the zinc target for the Douger Branch watershed (as Missouri's chronic criterion) is 143 $\mu\text{g/L}$ as dissolved zinc. Expressed as total recoverable zinc (as Kansas' criteria are calculated), that is 145 $\mu\text{g/L}$.

Background Information and Water Quality Data

Past underground mining of lead and zinc occurred in the Baldwin Park area just northeast of the city of Aurora in the upper Douger Branch watershed. Douger Branch (sometimes called Chat Creek) has elevated levels of zinc in that area. After mining ceased in 1955, these underground

¹ $\mu\text{g/L}$ = micrograms per liter, which is the same as parts per billion

mines filled with groundwater and zinc minerals in the walls of the mines dissolved into this groundwater. Zinc-contaminated groundwater from these mines is now resurfacing in a small tributary of Douger Branch (locally called Baldwin Park Tributary) along the railroad tracks about 0.5 miles east of town. Zinc levels in this tributary are especially high (see data table on page 3). Because compounds of zinc are generally soluble in neutral and acidic solution, zinc is readily transported in most natural waters and is one of the most mobile of the heavy metals. Hardness, dissolved oxygen, temperature and synergistic effects (more than the sum of the individual components) with other compounds all affect the toxicity of zinc to aquatic life². Zinc is an essential nutrient to aquatic and terrestrial organisms, but in excess can be highly toxic and has the tendency to bioaccumulate (build up in organisms) in the environment. A number of behavioral and physiological effects have been reported when test organisms have been exposed to increased zinc levels. Behavioral responses in fish include avoidance and changes in feeding rate and movement patterns. Physiological changes in fish include increased ventilation rates, frequency of coughing and a decrease in oxygen utilization.³

The U.S. Environmental Protection Agency (EPA), Region VII, first investigated Baldwin Park in October 1979. The investigation was initiated because a portion of Baldwin Park was used as a municipal dump following the closure of the mines. When it became a Superfund site, it was commonly called the Baldwin Park Dump. In 1987, EPA conducted a removal action for the area affected by the municipal dump. Then, in 2002, EPA conducted a Superfund removal action on lead-contaminated soils in residential yards, most of which were located inside the city limits of Aurora.

Baldwin Park has a history of lead and zinc mining on the property, in particular the southeast corner. The department is in the process of using federal Brownfield⁴ funds for a redevelopment project on the southeast corner of the park starting in 2005. By reducing metals mobility and availability on site, a reduction in the amount of zinc coming from the site may also be achieved.

The following table below shows all recent information on dissolved zinc levels in Douger Branch and Baldwin Park Tributary. Douger Branch becomes a classified stream⁵ at about site 4 (see map on page 4) and the data indicates the zinc standard is exceeded frequently at sites 2, 3, 5 and 6. It also shows that the pollution in Douger Branch comes from the Baldwin Park Tributary. Note the low zinc values in Douger Branch upstream of the tributary (site 4) and upstream of Baldwin Park (Site 1). Also, downstream around the wastewater treatment plant (sites 7 and 8) zinc levels are within water quality standards.

² Upper Sacramento River TMDL for Metals, California Environmental Protection Agency, 9/25/01.
www.swrcb.ca.gov/rwqcb5/TMDL/upperSacCdCuZn.html

³ Red Clay Creek TMDL, Delaware Natural Resources and Environmental Control, 8/1/99.
www.dnrec.state.de.us/DNREC2000/Library/Water/rcctmdl.pdf

⁴ Briefly, the term Brownfield refers to property that may be contaminated by hazardous waste, which would complicate the expansion, redevelopment, or reuse of that property. ("Small Business Liability Relief and Brownfields Revitalization Act" signed into law January 11, 2002)

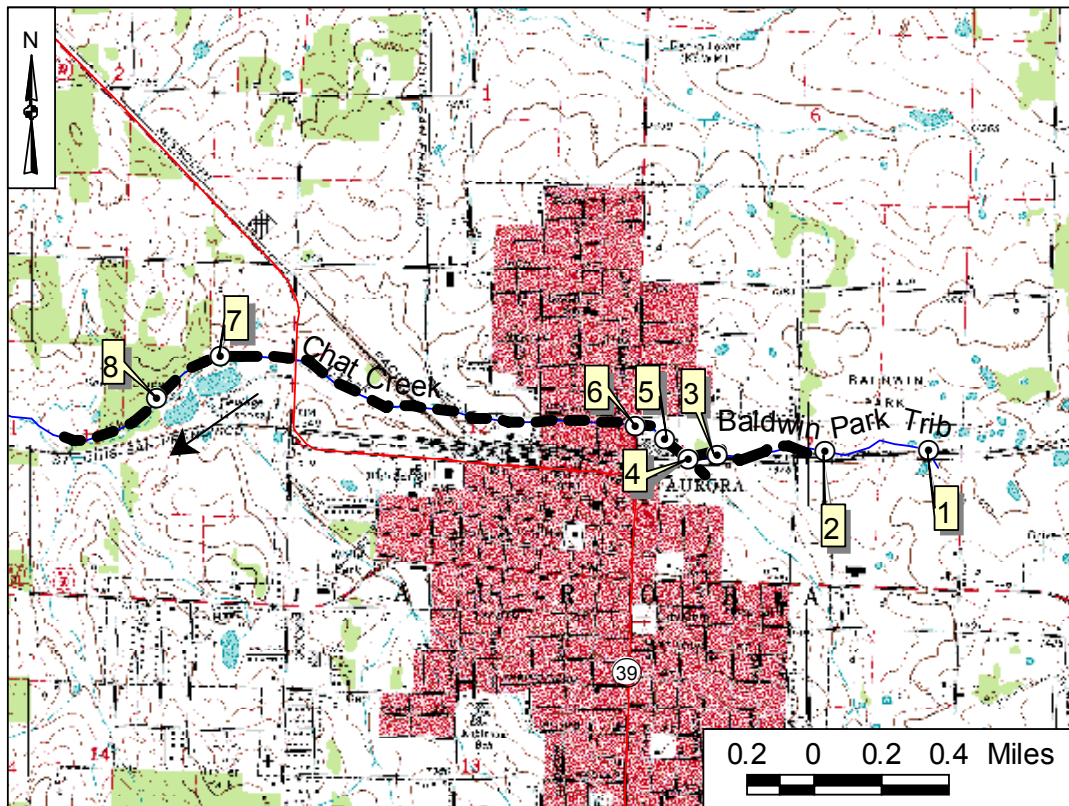
⁵ A classified stream either maintains permanent flow even in drought periods or may cease to flow in dry periods but maintains permanent pools which support aquatic life.

Water Quality Data for Douger Branch and Tributary						
Site No.	Site Name	Year	Month	Day	SC	Dissolved Zinc (µg/L)
1	Baldwin Pk.Trib. 0.76 mi.ab. Hwy 39	2001	3	14	438	62
1	Baldwin Pk.Trib. 0.76 mi.ab. Hwy 39	2001	4	16	343	233
1	Baldwin Pk.Trib. 0.76 mi.ab. Hwy 39	2001	5	21	255	316
	<i>Mean</i>				345	204
2	Baldwin Pk. Trib. 0.6 mi.ab. Hwy 39	2001	3	14	555	1090
2	Baldwin Pk. Trib. 0.6 mi.ab. Hwy 39	2001	4	16	496	673
2	Baldwin Pk. Trib. 0.6 mi.ab. Hwy 39	2001	5	21	365	555
	<i>Mean</i>				472	773
3	Baldwin Pk. Trib. 0.3 mi.ab. Hwy 39	2001	4	16	593	2190
3	Baldwin Pk. Trib. 0.3 mi.ab. Hwy 39	2001	5	21	546	2130
	<i>Mean</i>				570	2160
4	Douger Br. just ab. Baldwin Trib.	2001	3	14	530	237
4	Douger Br. just ab. Baldwin Trib.	2001	4	16	528	143
4	Douger Br. just ab. Baldwin Trib.	2001	5	21	512	166
	<i>Mean</i>				523	182
5	Douger Br. just bl. Baldwin trib.	2001	3	14	546	609
5	Douger Br. just bl. Baldwin trib.	2001	4	16	560	613
5	Douger Br. just bl. Baldwin trib.	2001	5	21	537	594
5	Douger Br. just bl. Baldwin trib.	2002	7	31	520	61.5
5	Douger Br. just bl. Baldwin trib.	2002	10	31	530	52.5
	<i>Mean</i>				539	386
6	Douger Br @ McNatt St., Aurora	2002	7	10	532	137
6	Douger Br @ McNatt St., Aurora	2003	2	21	586	484
6	Douger Br @ McNatt St., Aurora	2004	3	22	532	619
	<i>Mean</i>				550	413
7	Douger Br. just ab. WWTP	2001	3	14	598	58
7	Douger Br. just ab. WWTP	2001	5	21	437	35.7
	<i>Mean</i>				518	46.9
8	Douger Br. 0.05 mi.bl. WWTP	2001	3	14	376	45
8	Douger Br. 0.05 mi.bl. WWTP	2001	4	16	617	57.7
8	Douger Br. 0.05 mi.bl. WWTP	2001	5	21	504	33.7
8	Douger Br. 0.05 mi.bl. WWTP	2002	7	10	756	78.1
	<i>Mean</i>				563	53.6

Source: Missouri Department of Natural Resources
SC=Specific Conductivity in umhos/cm.

A map showing the location of these sample sites is on the next page.

Douger Branch in Lawrence County, Missouri, with Sampling Sites



--- Impaired Segment ← Direction of Flow

Site Index

- 1 – Baldwin Park Tributary to Douger Branch 0.76 mile above Hwy 39
- 2 – Baldwin Park Tributary to Douger Branch 0.6 mile above Hwy 39
- 3 – Baldwin Park Tributary to Douger Branch 0.3 mile above Hwy 39
- 4 – Douger Branch at railroad tracks just above Baldwin Park Tributary
- 5 – Douger Branch just below Baldwin Park Tributary
- 6 – Douger Branch at McNatt Street in Aurora
- 7 – Douger branch just above Aurora Wastewater Treatment Plant (WWTP)
- 8 – Douger Branch 0.05 mile below Aurora WWTP

For more information call or write:

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